

Training Aid:

CBRN SCBA User's Guide

February 21, 2007



DRAFT - DO NOT CITE OR QUOTE

DISCLAIMER

This information is distributed solely for the purpose of pre-dissemination peer review under applicable information quality guidelines. It has not been formally disseminated by the National Institute for Occupational Safety and Health. It does not represent and should not be construed to represent any agency determination or policy.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

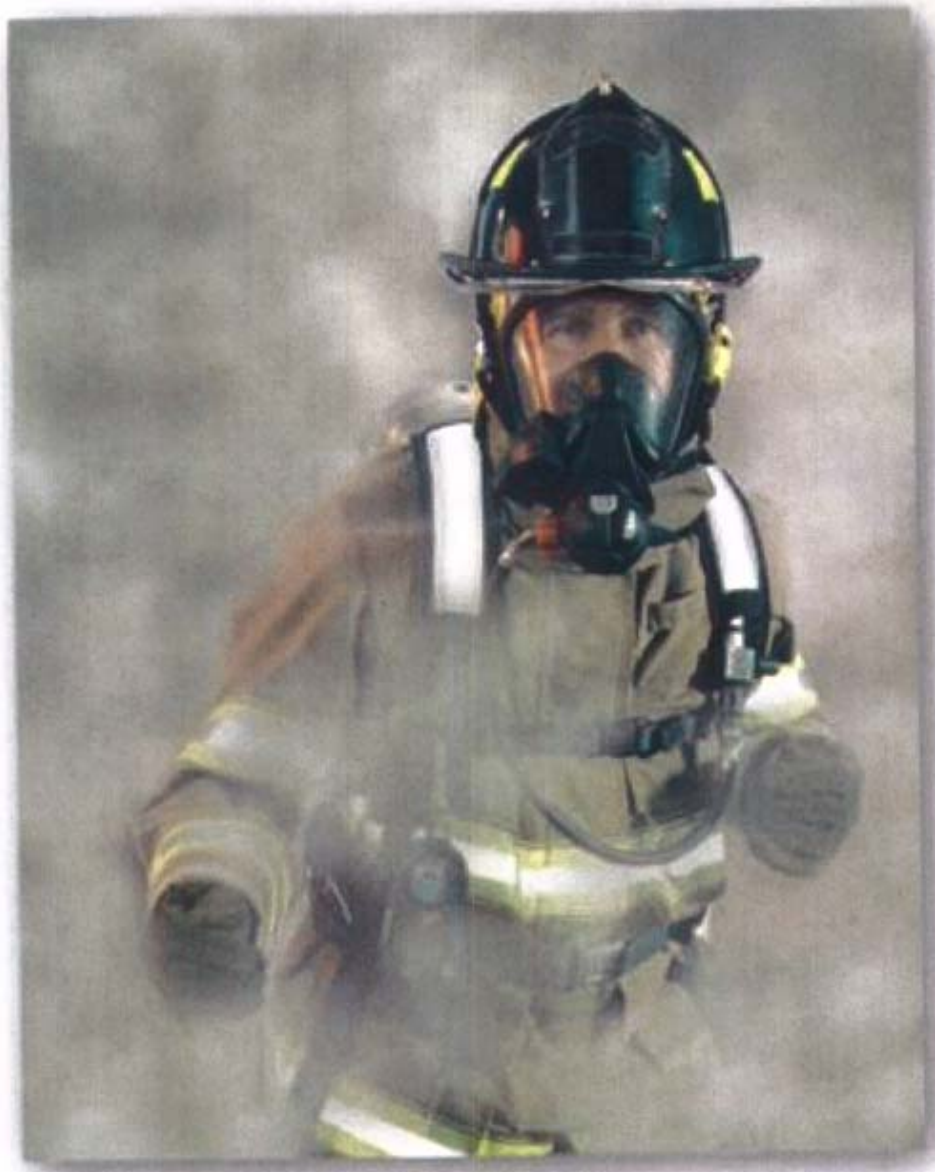


Workplace
Safety and Health



NPPTL National Personal Protective
Technology Laboratory

Front cover photography. The front cover of this training guide depicts three distinct workplaces in which a NIOSH-certified self-contained breathing apparatus (SCBA) with chemical, biological, radiological, and nuclear (CBRN) protections is currently used, *from left to right:* 1) responders conducting CBRN terrorism crime scene analysis, 2) municipal firefighter in a CBRN decontamination corridor, and 3) municipal law enforcement special weapons and tactics officers in a staging area for a barricaded bioterrorism suspect apprehension. These responders illustrate various types of protective ensembles and turnout gear that are worn with SCBA. Photographs 1) and 2) were taken upon invitation from Raymond V. DeMichiei, City of Pittsburgh Deputy Director, WMD Coordinator, in May 2005. Photograph 3) was taken upon invitation from Lt. Ed Allen, National Tactical Officers Association (NTOA), Fort Collins, Colorado, May 2005.



In the photograph above, the firefighter is wearing NIOSH-certified CBRN SCBA and full turnout gear in a simulated hazardous atmosphere. Photography is courtesy of Mine Safety Appliances (MSA) and modified by NIOSH from the original MSA business flyer depicting the state of the emergency responder market in 2004.

Ordering Information

To receive documents or more information about occupational safety and health topics, contact the National Institute for Occupational Safety and Health (NIOSH) at

NIOSH Publications Dissemination

4676 Columbia Parkway

Cincinnati, OH 45226-1998

Telephone: 1-800-35-NIOSH (1-800-356-4674)

Fax: 513-533-8573

E-mail: pubstaft@cdc.gov

or visit the NIOSH Web site at www.cdc.gov/niosh

Amanda: Put the following two sentences in a box:

This document is in the public domain and may be freely copied or reprinted.

Disclaimer: Mention of any company or product does not constitute endorsement by NIOSH.

DHHS (NIOSH) Publication No. 2007-XXX



This photograph illustrates a responder conducting air monitoring, with handheld devices, and incident documentation actions in a CBRN training exercise. The responder is in a fully encapsulated OSHA/EPA Level A/-NFPA 1994 Class 1 training ensemble and wearing a NIOSH-certified SCBA. Its second stage regulator is just barely visible in the center of the translucent 40mil PVC window. Notice the expanded back area that protects the SCBA. This photograph was taken on May 7, 2005, during the City of Pittsburgh exercise response to a Sarin (GB) vehicle-improvised explosion device (VIED) detonation.



Note: This photograph is not intended to depict the appropriate dermal protection.

This photograph illustrates six special weapons and tactics officers firing individual weapons at training targets while using standard tactical gear, NIOSH-certified SCBA, and protective gloves. A distinct cant of the weapon is necessary to attain a sufficient chin-to-stock hologram sight picture while "on-air." Sheathed SCBA cylinders, an unsheathed cylinder, an empty round casing discharging, and a tan-colored target silhouette are visible. Photo was taken in May, 2005 during National Tactical Officers Association (NTOA) tactical SCBA course instruction for members of the Fort Collins Police Department, Pawnee Grasslands, Fort Collins, Colorado.

Foreword

"Our greatest and gravest concern, however, is WMD in the hands of terrorists."

National Strategy for Combating Terrorism, President George W. Bush, The Whitehouse, September, 2006.

The purpose of this *Training Aid: CBRN SCBA User's Guide* is to train responders and administrators in the best practices of recognizing and using NIOSH-certified self-contained breathing apparatus (SCBA) with chemical, biological, radiological, and nuclear (CBRN) protections. This training aid defines a 10-step process that leads the emergency responder through a concise sequence on how to recognize administrative labels that distinguish a NIOSH-certified SCBA with CBRN protections from a non-CBRN SCBA and how to use a CBRN SCBA effectively. This training aid also assists the user in locating and understanding the specific NIOSH cautions and limitations related to the use of the CBRN SCBA. The step sequence also provides follow-on best practice recommendations on how to apply a new concept called CBRN respirator use life (CRUL), which trains the user to recognize SCBA facepiece indicators of concern and the proper corrections. This training aid closes with recommendations for a CBRN SCBA decontamination plan. The Appendices provide two detailed component call-out diagrams of common CBRN SCBA.

When used in conjunction with an existing respiratory protection program, this training aid is expected to increase the efficacy of CBRN SCBA use during emergency events. Properly used, a NIOSH-certified CBRN SCBA protects emergency responders against all respiratory hazards associated with CBRN terrorism contamination or exposures, as well as all traditional respiratory hazards created by fire, hazardous materials, illicit drugs, or natural disasters. The NIOSH respirator certification program sustains the national inventory of available respirators and increases homeland security preparedness.

Pre-event hands-on training with fitted personal protective equipment is key to a successful "all hazards" response. This CBRN SCBA training aid is a proactive measure to support realistic training of users in pre, during, or post-event scenarios. This durable training aid is designed for easy use, storage, and re-supply. As a bound paper or electronic PDF file, it can fit into an emergency responder's pocket, be uploaded on a personal data accessory (PDA), or restructured for formal training use in a classroom.

Numerous models of SCBA with CBRN protections have been certified by NIOSH since the first approval was issued on May 31, 2002. Certifications of new types of CBRN SCBA and standards development for next generation CBRN respirators continue.

For more information about NIOSH-certified SCBA with CBRN protections and use guidelines call 1-800-35-NIOSH or visit the website at:

<http://www.cdc.gov/niosh/npptl/topics/respirators/cbrnapproved/scba/>.

Director,
National Institute for Occupational Safety
and Health

Director,
National Personal Protective Technology
Laboratory

Acknowledgements

NIOSH expresses sincere gratitude to Bruce Teele, National Fire Protection Association (NFPA); Jeffrey O. Stull, International Personnel Protection, Inc.; Robb Pilkington, University of Missouri Fire and Rescue Training Institute; John Eversole, International Association of Fire Chiefs (IAFC); John Kuhn, Mine Safety Appliances Company (MSA); John Morris, International Safety Instruments (ISI); Greg Gatlin, Tyco/Scott Health & Safety; Bob Sell, Draeger USA; and Mike Swofford, Interspiro for their technical review, comments, and photographic releases.

Mr. Raymond V. DeMichiei of the City of Pittsburgh, Office of the Mayor, Bureau of Fire, Emergency Management Agency/Homeland Security, Mr. Stephen Hughes of the United States Capitol Police, Lt. Ed Allen of the Seminole County Sheriff's Office and the tactical SCBA instructors/users in the National Tactical Officer's Association (NTOA) are deeply appreciated for the invitations to NIOSH that allowed a NIOSH scientist to observe, train, advise and photograph the respective responders using NIOSH-certified respirators.

A special thanks to Amanda Ford of EG&G Technical Services, Inc. for graphics support.



This photograph depicts a fire department ladder truck gross decontamination station and responders processing through its high-volume, low-pressure water spray, prior to continuing on to the technical decontamination stations during a local training exercise. Responders are in Level B ensembles and moving in a 360-degree circle, with extended arms, before leaving the spray. This photograph is a video still image made by Charles W. Urban, NIOSH Audiovisual Production Specialist, from a video taken in May 2005 upon invitation from Raymond V. DeMichiei, Deputy Director, WMD Coordinator, City of Pittsburgh, PA.

Table of Contents

	Page
Foreword _____	vii
Acknowledgements _____	viii
How to Use this Training Aid _____	xi
Acronyms _____	xii
Glossary _____	xiii
Step 1 Locate the Required Labels _____	i
Step 2 Verify Backframe Harness Assembly NIOSH Label _____	2
Step 3 Verify SEI Compliance Label _____	3
Step 4 Verify CBRN Agent Approved NIOSH Label _____	5
Step 5 Verify Paper Matrix-Style Approval NIOSH Label _____	8
Step 6 Know the NIOSH Cautions and Limitations _____	9
Step 7 Apply the CBRN Respirator Use Life (CRUL) _____	16
Step 8 Know the User's Instructions _____	18
Step 9 Know the Facepiece Indicators of Concern _____	19
Step 10 Review Decontamination Methods _____	21
Appendix A: Component Diagram – Detachable Regulator _____	23
Appendix B: Component Diagram – Non-Detachable Regulator _____	24
Appendix C: References _____	25
Notes _____	26



This photograph illustrates a County Sheriff's emergency response team participating in training exercises in Level B ensembles during an "assault" on a barricaded CBRN hostage, April 22, 2001. Red smoke in the right simulates a CBRN weapons release. Note the handheld 4-gas detector in use. This photograph is courtesy of Scott Health and Safety, 2001.

How to Use this Training Aid

This user's guide is designed as an informational and instructional guide to aid responders and administrators in identifying chemical, biological, radiological, and nuclear (CBRN) self-contained breathing apparatus (SCBA) and in using these respirators effectively during an emergency event. The guide consists of a 10-step training sequence that should be followed in order to gain the maximum instructional value.

Throughout the user's guide, yellow circles with numbers on illustrations indicate the location of labels that are required to be present on NIOSH-approved CBRN SCBA or in the user's instructions of the respirator. These numbers correspond to information in the text that describes in detail the required adhesive or paper labels located on the backframe of CBRN SCBA or inserted in the user's instructions.

Steps 1-10 are setup to "train" the reader of this guide on the most basic and critical information that a responder would need to know to identify and use a NIOSH-approved CBRN SCBA. This guide steps the reader through the identification of a NIOSH-approved CBRN SCBA, the Cautions and Limitations associated with the respirator, the concept of CBRN respirator use life (CRUL), the value of knowing the user's instructions that accompany a CBRN SCBA, the critical indicators of concern for the facepiece, and the importance of reviewing decontamination methods before an emergency event occurs.

Note: Where the actual NIOSH Cautions and Limitations language appears in this text, it is shown in *italics* and the corresponding letter indicators are in quotations marks.

Appendix A and B provide detailed illustrations of a generic CBRN SCBA and a NIOSH-Certified CBRN SCBA and standardized terminology for the various parts of an SCBA. In addition, there are blank Notes pages at the end of this guide provided for notetaking.

Acronyms

BA	breathing apparatus
CBRN	chemical, biological, radiological, nuclear
CRUL	CBRN respirator use life
CWA	chemical warfare agent
EOSTI	end-of-service-time indicators
EPA	Environmental Protection Agency
GB	Sarin (nerve agent)
HD	Sulfur mustard (blister agent)
HUD	heads-up display
IDLH	immediately dangerous to life or health
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PASS	personal alert safety system
PPE	personal protective equipment
PSIG	pounds force of pressure per square inch gauge (excluding atmospheric pressure)
RIT	rapid intervention team
SCBA	self-contained breathing apparatus
SEI	Safety Equipment Institute
STP	standard test procedures
UAC	universal air connection system
UI	user's instructions

Glossary

air cylinder

air hose

Clear ...

don To put on a respirator or personal protective clothing on the head or body.

doff To remove a respirator or remove personal protective clothing from the head or body.

Level A The highest category of personal protective equipment based on the degree of protection afforded as defined by the Occupational Safety and Health Administration (OSHA). Level A is selected when the greatest level of skin, respiratory, and eye protection is required. OSHA defines four levels of personal protective equipment including Levels A, B, C, and D.

Level B The second highest category of personal protective equipment based on the degree of protection afforded as defined by OSHA. Level B is selected when the highest level of respiratory protection is required, but a lesser level of skin protection is needed. OSHA defines four levels of personal protective equipment including Levels A, B, C, and D.

Mayday... Vocal command issued by the responder in a time of severe distress or dire emergency.

Non-CBRN A description indicating that a respirator does not have chemical, biological, radiological, and nuclear protections.

Glossary, continued

on-air	The state of protected breathing for a user wearing an SCBA (CBRN or non-CBRN protected, open circuit, pressure demand). This state consists of a user who has successfully donned an SCBA backframe and harness assembly, activated the SCBA cylinder valve to the fully open position, donned a fit tested facepiece, and taken an initial inhalation breath known as a "first-breath activation," followed by a function seal check. It results in a mission specific respiratory protection provided to the user "on-air" that is based on the duration of the SCBA cylinder, user breathing rate, physical fitness of the user, NIOSH approved protections, and other respirator performance standards when used in conjunction with the wearing of additional personal protective equipment appropriate to the hazard.
reseal	To
user seal check	A term used by OSHA and ANSI to indicate an action conducted by the respirator user to determine if the respirator is properly sealed to the face.

Step 1 LOCATE THE REQUIRED LABELS

Required Adhesive Labels

NIOSH-certified chemical, biological, radiological, and nuclear self-contained breathing apparatus (CBRN SCBA) are required to have the following three adhesive labels displayed on the backframe of the respirator:

- NIOSH backframe harness assembly label (Label **1** in Figure 1)
- Safety Equipment Institute (SEI) certification label for compliance to the National Fire Protection Association (NFPA) 1981 Standard, current edition (Label **2** in Figure 1)
- NIOSH CBRN Agent Approved label (Label **3** in Figure 1)

Examples of each label are indicated by yellow circles with numbers in Figure 1 below and correspond to the labels listed above.

The three required adhesive labels must be affixed anywhere on the backframe assembly of the CBRN SCBA. NIOSH requires the words be visible and easily read. The NFPA 1981 Standard specifies font sizes for the SEI certification label.

Required Paper Matrix-Style Approval Label

- The fourth label required by NIOSH is a NIOSH paper matrix-style approval label located in, or as an insert to, the respirator manufacturers' user's instructions (Label **4** in Figure 1B).

Step 1 LOCATE THE REQUIRED LABELS



Figure 1a. SCBA backframe and harness assembly depicting the locations of the three CBRN SCBA compliance adhesive labels: 1) NIOSH backframe harness label, 2) SEI certification label and 3) NIOSH CBRN Agent Approved label.

This photograph depicts Interspiro Inc.'s NIOSH-certified SCBA with CBRN protections, 2002.

Figure 1b. Example of a NIOSH CBRN SCBA matrix-style approval label 4.

Step 2 **VERIFY BACKFRAME HARNESS ASSEMBLY LABEL**

NIOSH Backframe Harness Assembly Label **1**

This required adhesive label confirms that the SCBA has met the first tier of CBRN protection certification, the traditional I3F approval process for industrial SCBA. This label contains the official Department of Health and Human Services (DHHS) logo and the NIOSH logo, company name and address of the approval holder, and a complete description of the respirator. The lined table at the center of the label lists the following:

- approval numbers
- product names (of the SCBA marketed by the company)
- time duration of the cylinder
- working pressure of the SCBA.

The label also contains the Cautions and Limitations in three sections. The first two sections provide guidance for a traditional SCBA (without CBRN protections) and the third section provides guidance for an SCBA *with* CBRN protections:

- 1. Protection
- 2. Cautions and Limitations
- 3. Cautions and Limitations: CBRN

Without this label, the first tier of CBRN approval is not verified.

The NIOSH backframe harness assembly label can be any color or font size, must be readable, and affixed to the backframe of the SCBA. If the label is unreadable or deformed, consult the manufacturer or NIOSH. Older versions of this label are metal plates attached to the backframe of the SCBA.

Step 2 VERIFY BACKFRAME HARNESS ASSEMBLY LABEL, *CONTINUED*

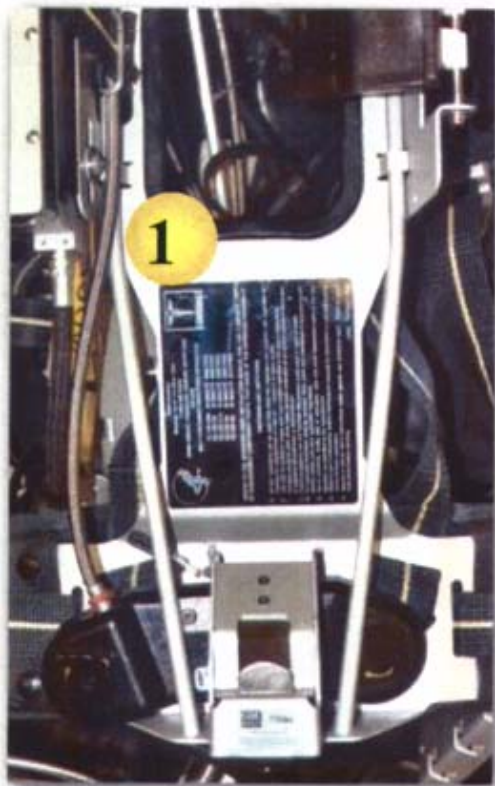


Figure 2a. An SCBA harness assembly with general location of a large black NIOSH backframe harness assembly label in the center (1). Photograph was taken in January 2006 during attendance of a 40-hour HAZMAT Operations Course, upon invitation from Leslie Murphy, United States Capitol Police (USCP), Washington, DC. The SCBA in the photograph is a product of Tyco/Scott Health & Safety.

 <p>INTERSPIRO, INC. 31 BUSINESS PARK DRIVE, BRANFORD, CT 06405 PHONE (800) 468-7788</p> <p>SPIROMATIC/SPIROLITE 9030, 9630, 4530, 4515 OPEN-CIRCUIT, PRESSURE DEMAND, ENTRY AND ESCAPE SELF-CONTAINED BREATHING APPARATUS OR COMBINATION SELF-CONTAINED BREATHING APPARATUS AND SUPPLIED AIR RESPIRATOR</p> 			
TC-13F-132	SPIROMATIC/SPIROLITE 4515	30 MINUTE	2216 P.S.I.G.
TC-13F-133	SPIROMATIC/SPIROLITE 4530	30 MINUTE	4500 P.S.I.G.
TC-13F-212	SPIROMATIC/SPIROLITE 9630	45 MINUTE	4500 P.S.I.G.
TC-13F-197	SPIROMATIC/SPIROLITE 9030	60 MINUTE	4500 P.S.I.G.
TC-13F-199	SPIROMATIC/SPIROLITE 9030 W/SUIT VENTILATION	60 MINUTE	4500 P.S.I.G.

CAUTIONS AND LIMITATIONS:
(REFER TO THE APPROVED USER INSTRUCTION MANUAL FOR THE COMPLETE LIST OF SUBASSEMBLY COMPONENT PARTS THAT MAKE UP THE APPROVED ASSEMBLY.)

- Do not use respirators unless used only when the respirators are supplied with respirable air. Meeting the requirements of CGA G-7.1 Grade D or higher purity.
- Use only the pressure ranges and hose lengths specified in the user's instructions.
- Contains electrical parts which have not been evaluated as an ignition source in flammable or explosive atmospheres by MSHA/NIOSH.
- Failure to properly use and maintain this product could result in injury or death.
- All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, CGA, and other applicable regulations.
- Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified in the manufacturer.
- Refer to users instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
- Special or critical users instructions and/or specific use limitations apply. Refer to instruction manual before donning.

Figure 2b. An example of a NIOSH backframe harness assembly label (see 1 in Figure 1a) showing traditional NIOSH levels of protection including model, duration, and pressure rating for each TC-13F-approval number. Photograph courtesy of Interspiro, Inc., 2002.

Step 3 VERIFY SEI CERTIFICATION LABEL

SEI Certification Label for Compliance to the NFPA 1981 Standard

2

This required adhesive label incorporates the logo of the Safety Equipment Institute (SEI) and identifies the edition of the NFPA 1981* Standard that was in effect at the time of the NIOSH approval of the SCBA. The SEI is a private third-party nonprofit organization that issues technical performance certifications to respirator manufacturers meeting the NFPA 1981 Standard.

*Note: "1981" refers to the number identifying the specific standard; it does not refer to a calendar year.

The Impact of SEI Certification on NIOSH Approval

The first NIOSH-certified SCBA with CBRN protections was certified to the NFPA 1981 Standard, 1997 edition. Subsequently, the 2002 edition and, currently, 2007 edition of the NFPA 1981 standard have been published. The SEI certification label indicates that the SCBA has met the requirements of the *NFPA 1981 Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire and Emergency Services*. The requirements for SEI certification are based on the current edition of the standard in effect at the time of NIOSH certification to CBRN protections. Without the SEI certification for NFPA 1981 compliance label, the second tier of NIOSH CBRN protections is not verified. The most current NFPA 1981 standard, 2007 edition, mandates NIOSH CBRN protections for NFPA-compliant SCBA. *Note: Interested users should refer to the NIOSH Letter to All Respirator Manufacturers, dated December 8, 2006, for specifics on the joint NIOSH/NPPTL and NFPA CBRN SCBA approval process for NFPA 1981, 2007 edition, respirator approvals.*

Recognizing the SEI Certification Label

The SEI certification label can be any color, but must be a font size specified by the NFPA. The label must be readable, affixed to the SCBA with no evidence of destruction, and state appropriate NFPA language (as shown in Figure 3a below). Recognize this label and when it is present, the CBRN SCBA, as a respirator system, has met the voluntary requirements of the NFPA standard and the traditional NIOSH 42 CFR Part 84 technical requirements.



Figure 3a. Example of an SEI certification label, showing compliance to NFPA 1981 standard, 1997 edition (to see SEI certification label's location on the backframe harness assembly, see 2 in Figure 1a, Step 1, page 1.) Image courtesy of Interspiro, Inc., 2002.

Step 3 VERIFY SEI CERTIFICATION LABEL, **CONTINUED**



Figure 3b. SCBA backframe and harness assembly showing a partial NIOSH backframe harness assembly label at the top of the photograph and a red SEI certification label (2) on the backframe of an SCBA. An administrative number "182," assigned by the municipality, appears on the yellow sticker. Photograph was taken upon invitation from Steve Hughes, United States Capitol Police (USCP), SCBA staging site, January, 2006. Respirator design is courtesy of Tyco/Scott Health & Safety.

Step 4 VERIFY CBRN AGENT APPROVED LABEL

NIOSH CBRN Agent Approved Label

3

This required NIOSH adhesive label must be present on the backframe to signify that the SCBA has CBRN protections. There are two versions of this label, new and retrofit.. Only **one** NIOSH CBRN Agent Approved Label must be attached to the backframe of the CBRN SCBA. All NIOSH CBRN Agent Approved Labels should be white with black font. The versions of this label are:

- Original CBRN Agent Approved Label (with CDC and NIOSH logos)
- Original "Retrofit" CBRN Agent Approved Label (with CDC and NIOSH logos)
- Current CBRN Agent Approved Label (with NIOSH logo)
- Current "Retrofit" CBRN Agent Approved Label (with NIOSH logo)

Original CBRN Agent Approved Label:

The *original* CBRN Agent Approved Label signifies that the respirator was originally approved as a CBRN SCBA. This is a single white label with black font and must be attached to the backframe of the harness assembly of the SCBA (see Figure 4a) and it has both the CDC and NIOSH logos.

If the label is scratched or unreadable, contact the manufacturer or NIOSH for confirmation of CBRN protections before use. NIOSH CBRN Agent Approved labels are white with black font.



Figure 4a. Example of an original CDC NIOSH CBRN Agent Approved adhesive label (see label 3 in Figure 1a, Step 1, page 1)

Original "Retrofit" CBRN Agent Approved Label: The *original retrofit* CBRN Agent Approved Label signifies that the respirator was a previously deployed traditional NIOSH-approved respirator, SEI certified to NFPA 1981, and later upgraded to a NIOSH-certified respirator with CBRN protections through the application of a retrofit kit. This label is a single white label with black font and must be attached to the backframe of the harness assembly of the SCBA. The word "Retrofit" must be present on the label to signify that the respirator was retrofitted. (See Figure 4b.)

Step 4 VERIFY CBRN AGENT APPROVED LABEL CONTINUED

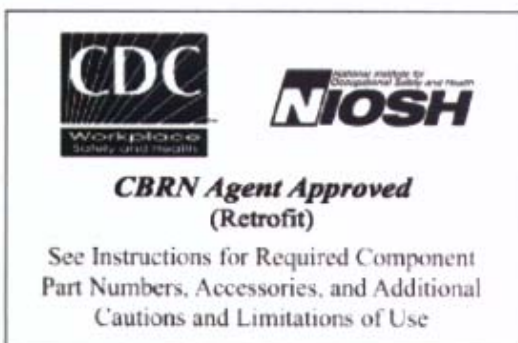


Figure 4b. Example of a CDC NIOSH CBRN Agent Approved (Retrofit) adhesive label.

Current NIOSH CBRN Agent Approved Label: The *current* CBRN Agent Approved Label signifies that the NIOSH-certified respirator was originally approved as a CBRN SCBA *after* December 5, 2005 (see Figure 4c). The only difference between the *original* CBRN Agent Approved Label (see Figure 4a) and the *current* CBRN Agent Approved Label is that the *current* label does not have the CDC logo.

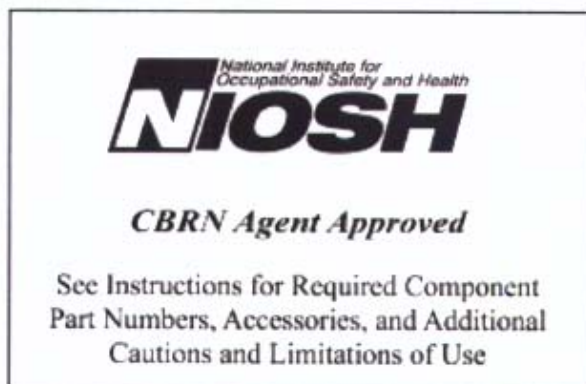


Figure 4c. Example of a "new" original NIOSH CBRN Agent Approved adhesive label, minus the CDC logo, that was effective December 5, 2005.

Current NIOSH "Retrofit" Agent Approved Label. The current "retrofit" Agent Approved Label signifies that the field-deployed SCBA has been retrofitted to a NIOSH-certified respirator with CBRN protections *after* December 5, 2005; the label appears as shown in Figure 4d. Retrofitting is done by use of a NIOSH-approved retrofit kit that has been installed in accordance with the manufacturer's instructions or installed by the manufacturer. The standard NIOSH logo and additional instructions are required to be present and readable.

Step 4 VERIFY CBRN AGENT APPROVED LABEL, *CONTINUED*

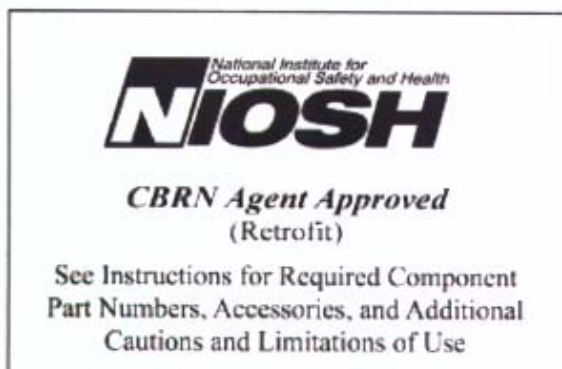


Figure 4d. Example of a current "retrofit" NIOSH CBRN Agent Approved Label, effective December 5, 2005(see label 3 in Figure 1a, Step 1, page 1.)

Step 5 VERIFY PAPER MATRIX-STYLE APPROVAL LABEL

Paper Matrix-Style Approval Label to Confirm Part Numbers

In a pre-event posture, locate the paper matrix-style approval label and use it to validate that a part number(s) are CBRN protected and to verify the SCBA is assembled with the parts listed (see Figure 5 below). If the part numbers on the respirator or on the label cannot be read or if there is any doubt that a part number is NIOSH-certified, consult NIOSH or the manufacturer before use. For CBRN SCBA, the Department of Health and Human Services (DHHS) logo, the NIOSH logo, and a copy of the NIOSH CBRN Agent Approved Label are required to be on the official paper label. All part number information on this paper approval label must match the information on the backframe of the CBRN SCBA.

[illegible]

Figure 5. Example of a NIOSH CBRN SCBA matrix-style approval label 4.

Step 6 KNOW THE CAUTIONS AND LIMITATIONS

Description and History

Cautions and Limitations are regulatory language relating to the use of respirators based on 25 years of respirator science and the use of respirators in the industrial sector. They contain NIOSH-mandated statements that can also serve as ideal training topics for responders.

Cautions and Limitations are listed at the bottom of the paper NIOSH matrix-style approval label (see Figure 5 in Step 5) in three sections as follows:

1. Protection. This section outlines the approved protection acronyms recognized by NIOSH in the formal approval letter. Examples of protection words or phrases and their acronyms (in parentheses) include: self-contained (SC), pressure demand (PD), and chemical, biological, radiological, and nuclear (CBRN). These are protection ratings that define a type of protection or a level of protection. Type refers to the protection against a type of contaminant such as a CBRN contaminant. Level refers to a level of protection such as a change in the type of facepiece or air supply capacity. PD and SC are levels of respirator protection.

2. Cautions and Limitations. These are Cautions and Limitations from respirator use in the industrial sector that apply to the SCBA (ie: a non-CBRN SCBA) when used in structural firefighting or hazardous material responses.

3. Cautions and Limitations: CBRN. These are the additional limitations that are mandatory for use in a CBRN response. Training on the identified Cautions and Limitations, coupled with knowledge of jobsite hazards, experienced respirator decision logic, and respirator use life factors, afford workers a greater probability of not being exposed. Even when personal protective equipment (PPE) may be contaminated, if the equipment performs as designed, the worker will not be exposed. Immediately dangerous to life or health (IDLH) and "less than IDLH" values characterize the workplace and are employed as respirator-use decision factors for any type of NIOSH-certified respirator. If a site is uncharacterized, users should default to maximum protection afforded by the use of a NIOSH-certified SCBA with CBRN protections.



hazard zone transition lane. Each responder must be knowledgeable of the NIOSH cautions and limitations assigned to the respirator they are using, so knowledgeable that their actions are second nature when it comes to using the respirator in accordance with NIOSH and manufacturer's cautions and limitations. Notice the visible SCBA, the wet surfaces from facility decontamination sprays, and the 5 gallon buckets used to carry site assessment tools. Photograph is from NIOSH observations of the City of Pittsburgh, PA, full scale CBRN exercise, May 7, 2005.

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, *CONTINUED*

Section 2 Cautions and Limitations: Grounded in Industrial NIOSH Science

Section 2 of the Cautions and Limitations contains six statements that rely on the fundamental NIOSH respirator certification program which began in the industrial workplace. Currently, these cautions and limitations are used in regard to structural firefighting or other IDLH conditions and, when necessary, CBRN incident use. The following six statements from Section 2 of the Cautions and Limitations are specific to SCBA respirators. Each statement has a letter indicator followed by the mandatory Cautions and Limitations language. The highlighted keywords are provided as a concise reference for each statement.

Not Intrinsically Safe.

“I” Contains electrical parts, which have not been evaluated as an ignition source in flammable or explosive atmospheres by MSHA/NIOSH.

Injury or Death From Misuse.

“J” Failure to properly use and maintain this product could result in injury or death.

OSHA Use Requirements

“M” All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.

Parts are non-exchangeable. Do not intermix

“N” Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer.

Maintain per the User’s Instructions

“O” Refer to user’s instructions (UI), and/or maintenance manuals for information on use and maintenance of these respirators.

Other Information.

“S” Special or critical UI and/or specific use limitations apply. Refer to UI before donning.



CBRN SCBA provide multipurpose utilization and can be used in traditional hazmat response, firefighting, clandestine lab interdiction, or CBRN incident response conditions. This photograph depicts technical decontamination station operations performed on a Level A responder wearing the yellow/green ensemble. Notice Level B responder with exposed SCBA, the yellow decontamination lane containment system, and walking cane assistance. Photograph taken May, 2005 during CBRN exercise, City of Pittsburgh, PA.

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, *CONTINUED*

Statement "S" Mandatory Hydrostatic Testing for Cylinders

Under statement "S" in Section 2 of the Cautions and Limitations, one of the parameters of special instructions is the ability to confirm that the SCBA cylinder is hydrostatically tested. To verify that a SCBA cylinder is compliant to the Department of Transportation (DOT) requalification/hydrostatic testing, the user must locate the hydrostatic test date stamp. The user must then verify that the hydrostatic test date on the cylinder has not expired. In order to determine if the cylinder has expired, locate the manufacturer's original date of production of the cylinder. Once located, utilize the current calendar date to determine if the cylinder requires hydrostatic testing. If the cylinder requires hydrostatic testing, look for the hydrostatic test date stamp. If no test date stamp is found, submit the cylinder for hydrostatic requalification. All SCBA users have the responsibility of verifying that the SCBA has a valid testing stamp:

User Responsibilities:

Emergency responders in the field should perform the following:

- Conduct visual inspection of cylinder before use.
- Locate and verify the required labels. If it is determined that the cylinder has expired, do the following steps:
 - Find the cylinder "manufactured date": (i.e. production date)
 - Determine what type of material the cylinder is made of (i.e. steel, aluminum, carbon, etc.)
 - Utilize the manufacturer's specified hydrostatic test date intervals found in the UI (ex: A carbon-fiber wrapped cylinder is required to be hydrostatically tested every 3 years.) However, select types of carbon fiber cylinders are required to be tested every 5 years. All carbon fiber cylinders have a 15-year service life.
- Protect the cylinder valve stem and handle during use and cylinder changeout.

Technician Responsibilities:

Respiratory protection program managers or administrators have the responsibility of managing the respirator program and ensuring the overall safe use of all respirator equipment. Supporting the managers are the trained technicians whose responsibility it is to perform the technical maintenance of the respirator system. Technicians are required to ensure that all SCBA are serviceable, safe, and maintained in accordance with the user's instructions and applicable, recognized standards.

Program administrators in the field should perform/know the following:

- Ensure SCBA cylinders are hydrostatic tested in accordance with U.S. Department of Transportation (DOT) requirements.

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, *CONTINUED*

- Most hydrostatic test completion dates are resin labels found on the cylinder in the form of a numeric code and symbol.

--The code consists of the month, a unique inspector mark (^), and the calendar year in two digits. For example, 7^05 which stands for July, ^ = tester, and 05. This means the hydrostatic test was passed in July, 2005. Three to five years from that date, depending on the type of cylinder, is the new hydrostatic test due date for carbon cylinder steel. Know the cylinder hydrostatic test due dates.

- Ensure the cylinder neck valves are tightened to specified torque foot lbs. per the SCBA manufacturer.
- Do not over tighten the cylinder neck valves.

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, *CONTINUED*

Section 3 of Cautions and Limitations: CBRN SCBA are Multipurpose

Transition terminology resulting in “CBRN SCBA”

Responders use several terms to indicate an SCBA respirator. Some are interchangeable terms such as breathing apparatus (BA) or “Air-Pak”®. Others may be the first name of the respirator manufacturer or the first name followed by “SCBA”. Conversely, the words “gas mask” or “respirator” are understood to mean a negative pressure air-purifying respirator (APR) or a powered air-purifying respirator (PAPR) and are considered completely separate from the SCBA. Per NIOSH respirator selection/use logic, both an SCBA and a “gas mask” are respirators, just different classes of respirators. Per 42 CFR Part 84, paragraph 84.2, (aa), a respirator* is defined as “any device designed to provide the wearer with respiratory protection against inhalation of a hazardous atmosphere.” With the introduction of a NIOSH-certified respirator with CBRN protection standards, the term CBRN respirator or, in this case “CBRN SCBA,” is becoming commonly understood.

Cautions and Limitations: CBRN

Section 3 of the Cautions and Limitations contains four statements that rely on new NIOSH science based on repeatable chemical warfare agent testing conducted by the U.S. Army under contract to NIOSH. Coupled with the Section 2 Cautions and Limitations, the more recent Section 3 Cautions and Limitations provide CBRN capabilities for the SCBA. Because of the integrated NFPA/NIOSH performance requirements, the user can effectively respond to structural fires, tactical law enforcement responses, or CBRN incidents with one type of SCBA—the multipurpose CBRN SCBA!

The following four statements from Section 3 of the Cautions and Limitations are specific to CBRN SCBA respirators. Each statement is preceded by a letter indicator followed by the mandatory cautions and limitations language. The bolded keywords are provided as a concise reference for each official statement. CBRN technicians should be thoroughly familiar them:

Use with personal protective equipment.

“Q” *“Use in conjunction with personal protective ensembles that provide appropriate levels of protection against (CBRN agent) dermal hazards.”*

Expect delayed effects.

“R” *“Some CBRN agents may not present immediate effects from exposure, but can result in delayed impairment, illness, or death.”*

Handling is direct contact with any physical state of the CBRN agent.

Decontaminate ASAP.

“T” *“Direct contact with CBRN agents requires proper handling of the SCBA after each use and between multiple entries during the same use. Decontamination and*

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, *CONTINUED*

disposal procedures must be followed. If contaminated with liquid chemical warfare agents, dispose of the SCBA after decontamination."

CBRN Respirator Use Life (CRUL) = 6 Hours.**

"U" *The respirator should not be used beyond six hours after initial exposure to chemical warfare agents to avoid possibility of continued agent permeation.*

***NOTE 1:** The word **respirator** is defined in accordance with 42 CFR Part 84 and indicates the entire SCBA respirator; this includes the facepiece/mask, harness assembly, regulator, high-pressure and low-pressure hose lines, cylinder, and any other authorized component/accessory, such as a cylinder cover or PASS device.

****NOTE 2:** Use beyond the six-hour mark in a chemical warfare environment is not suggested and further use could lead to increased risks in safety and health. For example, at the incident +5 mark (I+5) processing through the decontamination corridors should be initiated. After technical decontamination is complete, the user should safely doff the CBRN SCBA before the I+6 mark and the administrator/incident commander should ensure the CBRN SCBA hardware is properly contained in accordance with local standard operating procedures (SOP).

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, CONTINUED

Recommendations for CBRN SCBA Use in Level A or B

CBRN SCBA versus non-CBRN SCBA.

When SCBA are encapsulated by a protective ensemble, they are expected to assume the protective qualities of the suit material until that ensemble is ripped, compromised, or doffed. If the suit is compromised, the human respiratory system is then highly susceptible to CBRN agent exposure. A NIOSH-certified SCBA with CBRN protections will provide the greatest level of respiratory protection to the user, rather than a non-CBRN SCBA.

- The use of a non-CBRN SCBA in an OSHA/EPA Level A or Level B type suit should only be used as a last resort when CBRN SCBA are not available.
- Do not mix-or-match non-CBRN SCBA parts with CBRN protected parts.
- Use of a CBRN SCBA in an OSHA/EPA Level A or B protective ensemble/posture or NFPA-equivalent ensemble is highly recommended for any CBRN incident response.



Command and control directives, from a Level B responder (pointing), to a Level A responder in a CBRN hazard zone transition area. Hand and arm signals and eye contact play a significant communications role for encapsulated responders. If a secondary device ignites and disperses liquid Sulfur Mustard (HD) on the responders, the Level B responders have six hours before HD permeates the CBRN SCBA hardware. If the SCBA is not CBRN hardened, HD may cause catastrophic failure of the contaminated parts within minutes, as observed in NIOSH benchmarking tests performed by the U.S. Army RDECOM in 2001

Guidelines for Respirator Interface Challenges.

1. If respirator seal problems are detected during use, attempt to reseal and request evacuation from the CBRN hazard.
2. If evacuation/escape is not immediate and the respirator facepiece seal breaks due to slippage, impact, or seal insert crimping, attempt to purge out contaminants by use of the "by-pass valve or emergency airflow purge valve" and reseal immediately!
3. If reseal techniques fail, announce "Mayday," open the by-pass valve halfway, attempt to locate the breakage, clear the respirator if possible, and conduct a user seal check by running your fingers over the exterior sealing surface to help ensure a uniform sealing interface exists between your face and the respirator. Protect your eyes by closing them during by-pass valve high pressure airflow. Contacts may dislodge or fold due to by-pass high pressure air.
4. If the responder is in Level B or an equivalent level of protective posture, do not rely on SCBA over-pressurization airflow for protection before, during, or after a CBRN incident. If cool air is felt on the face in a hazardous atmosphere and symptoms are self- or buddy-detected, assume that the respirator seal is broken. Declare "May day" or "man down" and clear and reseal as soon as possible.

Step 6 KNOW THE CAUTIONS AND LIMITATIONS, *CONTINUED*

5. If the responder is in Level B, never wear the head harness of a facepiece over the hooded section of a protective ensemble. The face-to-facepiece seal of the respirator sealing surfaces are adversely affected by any intrusion, especially from the hood or any type of "skull" cap.
 6. In support of survival training, develop a CBRN SCBA donning time and function check standard and then practice them. Rely on the NFPA 60-second standard, but attain a seal on-air in less than 45 seconds, which leaves 15 seconds to don gloves. The minimum standard for donning the SCBA and going on-air should be in accordance with local standard operating procedures.
 7. The respirator should be the last piece of PPE removed during the decontamination process. Inhalation is the primary route of exposure for CBRN agents and, thus, a properly fit tested and correctly donned respirator plays a critical role in protecting the responder's breathing zone. Inhalation is considered the most severe route because there is not an immediate way to remove the contamination.
 8. Because repeatable science demonstrates the caustic effects of persistent chemical warfare agents (CWA), such as GB and HD liquid and aerosol, contaminated responders should decontaminate as soon as possible. In NIOSH laboratories, GB and HD at defined concentrations have demonstrated penetration and permeation effects on the entire SCBA airflow-pressure boundary, regardless of the point of contamination on the SCBA.
- With the knowledge of existing SCBA service life limitations, NIOSH recommends the establishment of a CBRN respirator use-life program (see Step 7 for further detail).
 - A list of NIOSH-certified CBRN SCBA and NFPA-compliant protective ensembles are located on several internet sites, one being the Inter-Agency Board (IAB) for Equipment Standardization and Interoperability link to the Responder Knowledge Base (RKB): <http://www.rkb.mipt.org/>.

Step 7 APPLY THE CBRN RESPIRATOR USE LIFE (CRUL), *CONTINUED*

CBRN Respirator Use Life (CRUL)

Description of CRUL

CRUL is a unique concept that defines a CBRN respirator's in-use time limitations. This concept is intended to provide the highest level of respiratory protection to the breathing zone of individual responders wearing serviceable and fit-tested CBRN respirators. The limitation is determined from rigorous scientific analysis of the protective qualities of a respirator's engineered breathing zone. This analysis was based on laboratory standard test procedures (STP) using a respirator that is mechanically breathing on a static SMARTMAN headform in controlled conditions of GB and HD contamination.

Actual field CRUL values may vary based on the hazardous concentration gradient encountered by the responder. However, the NIOSH laboratory CRUL value is the recommended maximum in-use time a specific type of CBRN respirator can be safely used after being potentially or actually contaminated with liquid chemical warfare agents.

CRUL based on Cautions and Limitations Statements

The concept of CRUL is based on the following NIOSH cautions and limitations statements "U" and "T." These statements describe the limit of CBRN protections against exposure to chemical warfare agents:

Limitation "U" specifies the following:

"The respirator should not be used beyond six hours after initial exposure to chemical warfare agents to avoid possibility of agent permeation."

Limitation "T" specifies the following:

"...If contaminated with liquid chemical warfare agents, dispose of the SCBA after decontamination."

CRUL Value for a CBRN SCBA

- Based on the limitation statements, the CRUL value for a CBRN SCBA is six hours. This means that the CBRN SCBA hardware, when contaminated with a chemical warfare agent (CWA) in aerosol or liquid form, has an in-use life of *six continuous hours*, beginning at the time of contamination.
- Based on rigorous testing of the "worst-case" chemical warfare agents (GB and HD), and because GB (108 Angstroms in molecular size) and HD are currently considered the worst-case contaminants, biological or radiological particulate contamination is not expected to limit the in-use life of a CBRN SCBA, provided weaponized biological or radiological particulates are not intermixed with chemical warfare agent. The onset of chemical warfare agent (CWA) contamination is determined by using qualitative/quantitative sampling methods in the field and confirmed by follow-on

Step 7 APPLY THE CBRN RESPIRATOR USE LIFE (CRUL), *CONTINUED*

laboratory analysis. The NIOSH chemical agent emergency response cards provide specific toxicology data and NIOSH recognized sampling methods:

<http://www.cdc.gov/niosh/topics/emres/chemagent.html>.

- Examples of current NIOSH-certified respirators with CRUL values are SCBA; air-purifying respirators (APR); powered air-purifying respirators (PAPR); air-purifying escape respirators (APER) and self-contained escape respirators (SCER).

Mandates for CBRN Respirator Use Life. Compliance with the following mandates is required in order to maintain NIOSH respirator approval for CBRN protections:

- Six-Hour In-Use Life
The in-use life time period is **six continuous hours of use in a contaminated liquid chemical warfare environment** or CWA aerosol/liquid/vapor confined-space environment and not a sum of smaller time periods of intermittent use over six, eight, or twelve hours. Intermittent or small time periods of use less than six hours, in contamination, do count toward a total six hours. Continued use or re-use is not recommended.
- Time Limit for Disposal of SCBA
A contaminated SCBA must be discarded within six hours after initial contact with any liquid chemical warfare agent, regardless of the duration or frequency of such contact. At the six-hour mark, the entire SCBA is initially decontaminated and disposed of properly, including the cylinder neck valve assembly. Air cylinder durations will dictate actual disposal decision times. The impact of vapor exposures is situation dependent and agent specific. Field/clinical medical tests and CDC specimen collection protocols are required.
- Use of Airline Accessories
Quick change of a cylinder or buddy breathing in a CBRN environment is not recommended. Contingency stocks of spare CBRN cylinders and replacement CBRN SCBA are recommended. Rapid intervention teams (RIT) and search and rescue teams should use CBRN SCBA and CBRN APR.



This photograph shows a litter evacuation of a training CBRN casualty from a sports venue. The responder in the center is in OSHA/EPA Level B protection. The other two responders are fire department EMS personnel and they are in OSHA/EPA Level C protection with CBRN APR. The yellow tape serves as a field expedient safeguard/seal enhancement measure between the respirator, glove, boot, and suit interfaces. This photograph was taken in May 2005, City of Pittsburgh, PA.

Step 8

KNOW THE USER'S INSTRUCTIONS

The manufacturer's user's instructions* (UI) are included with every purchase of a new CBRN SCBA and typically include proprietary guidance on:

*Note: also referred to as operations and maintenance manual.

1. Location of NIOSH labels, unique parts labeled "CBRN" by the manufacturer, CBRN cautions and limitations, and recommended training requirements
2. Description of respirator with pre-use, in-use, removal, and cold weather checks.
3. Donning and doffing in all conditions.
4. Fit testing, facial hair, and user seal check requirements.
5. Assembly and system warranty statements.
6. Air cylinder inspections, hydrostatic test requirements, and Grade D air specifications.
7. Legal and technical cautions, limitations, and warnings plus sanitization and decontamination/disposal guidance.
8. Maintenance inspection checklists.
9. Replacement parts.
10. Regulator function checks and free flow warnings due to underwater submersion.
11. Function of all end-of-service-time indicators (EOSTI) and rapid intervention team/university air connection system (RIT/UAC) connections
12. Function of the heads-up display (HUD).
13. Inspection of hose integrity for damage and tight hose connections
14. Function of personal alert safety system (PASS).
15. Function of air hatches, compact demand valves, or other specific SCBA air exchange designs related to facepiece regulator technology.
16. Air cylinder and cylinder neck valve assemblies supporting or not supporting interoperability of compatible SCBA breathing air cylinders and backframes.
17. Accessories that may increase the ballistic protection of components.
18. Conduct of a user seal check without inadvertently applying excessive hand pressure and thus creating a false respirator sealing surface or condition.

Note: See Appendix A, *Component Diagram – Non-Detachable Regulator*, and Appendix B, *Component Diagram – Detachable Regulator*, for generic terminology that identifies common components of a CBRN SCBA.



Step 9

KNOW THE FACEPIECE INDICATORS OF CONCERN

The facepiece may be donned incorrectly if:

A. The facepiece is fogged over and you are “on-air.”

User Corrections:

- 1) If you are in a *hazardous area*, escape immediately.
- 2) If you are in a *clean area*:
Remove (doff) the facepiece and re-don it.
If the user is wearing an ensemble, ensure the suit hood is over top of the respirator head harness and not underneath the head harness. Use anti-fog solution in advance to keep the facepiece from fogging up.
- 3) Check that the air cylinder valve is fully turned on.
- 4) If there is low pressure in cylinder, seek recharged or new fully charged breathing air cylinder.
- 5) If fogging continues while on-air, doff in a clean area. Evaluate the proper fit of the respirator sealing surfaces relative to mask size, fit test results, facial hair or hairline infractions, and other factors related to make, model, or comfort traits of the respirator.
- 6) Re-don the facepiece to verify that it seals correctly. If fogging continues while on-air, reevaluate the situation.



Figure 6. This illustration is a generic drawing of a NIOSH-certified SCBA with CBRN protection showing the distinct components of the respirator. This SCBA CBRN uses a mask-mounted regulator that is located by the red purge valve. This drawing is modeled after an MSA CBRN SCBA, 2006.

B. The second-stage regulator or air hatch/switch will not operate correctly or mate properly with the facepiece.

Contaminated atmosphere corrections:

- 7) If the second stage regulator fails in a *contaminated* atmosphere, turn the purge valve on and escape.

Clean atmosphere corrections:

- Disconnect the regulator and then reconnect it per manufacturer's instructions OR manually open and close the air hatch/switch.

Step 9

KNOW THE FACEPIECE INDICATORS OF CONCERN, *CONTINUED*

Note: NIOSH recognizes that Sarin (GB) and Sulfur Mustard (HD) permeate silicone material surfaces at a faster rate than other similar material surfaces; therefore, do not alter the airflow pathways or materials.

- Check that the facepiece matches the make and model of the regulator. Use the NIOSH matrix-style approval label to confirm compatible part numbers (refer to Step 5 for a description of this label).
- Ensure locking mechanisms are fully seated, not broken, and debris free. Re-don.

B) Heads-up display (HUD) is not working or you cannot see the HUD:

User Corrections:

- Doff. Inspect the HUD for damage. Use in accordance with the manufacturer's user's instructions while donned.
- Ensure the batteries are serviceable. Know battery life and replace depleted ones.
- Ensure the connections of the HUD are clean. Reconnect the second-stage regulator to the facepiece and ensure it is correctly attached. Re-don.

Step 10 REVIEW DECONTAMINATION METHODS

Decontaminate as soon as possible.

Whenever conditions permit during an emergency event, responders must decontaminate *as soon as possible*!

Be prepared before an emergency event occurs:

- Know the existing decontamination plan of the municipality.
- Keep in mind that the SCBA CRUL six-hour in-use life includes the time required to conduct the decontamination process (decon).
- The time required for disposal of a CBRN SCBA is not included in CRUL.
- Refer to NIOSH cautions and limitations "T" for handling and decontamination guidance.

Know what to do during an emergency event:

If known or suspected CBRN contamination is present on the SCBA and other PPE:

- **Keep respirator facepiece on.** Do not remove contaminated (or suspected of being contaminated) respirator facepiece during the decontamination process until instructed by a qualified responder.
- **Implement decontamination methods.** As the emergency situation permits, conduct emergency or gross wet or dry decon, followed by technical decon, using all available methods. The current primary method is the use of available fire department equipment to conduct ladder pipe/truck decon of CBRN casualties and responders. Other field-expedient operations exist; however, all these methods currently use high-volume, low-pressure, clean tepid water to reduce surface CBRN contamination permeation and off-gassing.
- **Administer consecutive water applications.** Per the CDC, responders should conduct three separate consecutive water applications per station. Utilize 5% common bleach solution as a supplemental decontamination solution.
- **Exercise prevention methods against CBRN toxicity.** Determine run-off wash contamination toxicity, and implement local prevention measures to preserve and protect responders, the public, municipal infrastructure, and the environment from the anticipated or known effects of CBRN run-off waste products. Certain chemical warfare agents may not be neutralized, and others may be hydrolyzed or diluted while being physically washed off equipment surfaces.



Firefighters conducting gross decontamination training using a low-pressure fog nozzle master stream in the decontamination corridor. Hot zone is to the left of the photograph. Firefighters are wearing turnout gear and SCBA respirators. Photograph is from NIOSH observations of the City of Pittsburgh, PA, CBRN exercise, 2005.

Step 10 REVIEW DECONTAMINATION METHODS, *CONTINUED*

Know what to do after an emergency event:

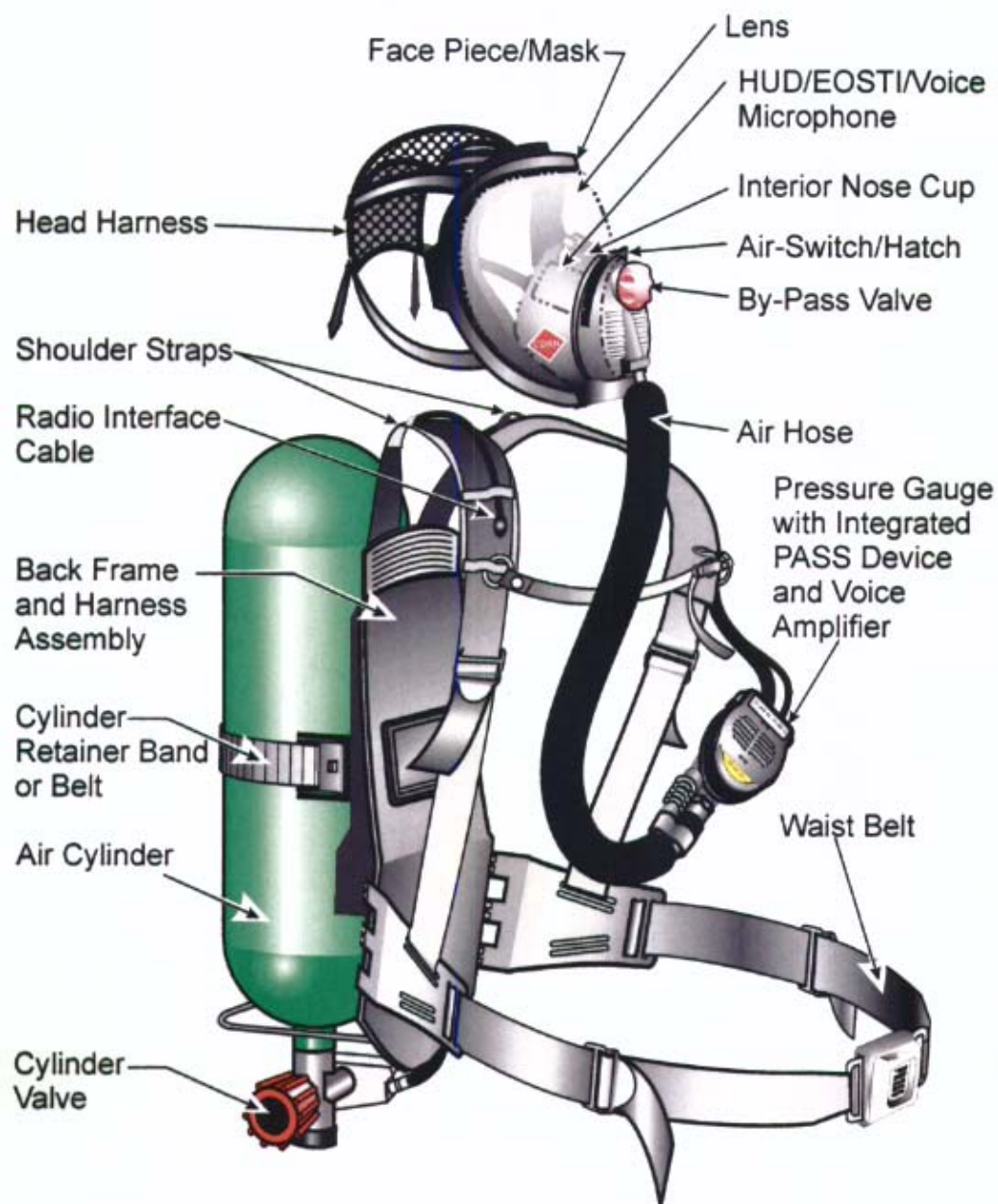
- **Use mitigation measures.** Contamination avoidance, sampling, monitoring, mitigation, and decontamination practices should be planned and responders trained in advance.
 - **Control lines** - Use vapor and liquid contamination control lines to delineate hazard zones in accordance with the prevailing wind direction and ambient temperature.
 - **Contaminated SCBA** - Users should ensure that known or potentially contaminated CBRN SCBA (or non-CBRN SCBA) are double-bagged in plastic, labeled with the type of contamination, the amount and type of decontamination solution used, and the technique used to conduct gross and technical decontamination.
 - **CBRN Respirator Use Life (CRUL)** - The contamination start time for SCBA and the amount and type of CBRN contamination are important factors relative to CRUL start time accuracy, and disposal timeline management. (See Step 7 for detailed description of CRUL.)
 - **Sampling and monitoring** - Repeatable and quantifiable CBRN agent sampling and detection methods are required. Accurate detection of CBRN agents on SCBA is incident dependent and subject to the consensus findings of qualified technicians that use recognized quantitative CBRN agent sampling and detection methods and analysis, generate repeatable data, exercise controlled sample custody, and provide conclusive agent identification results to the incident commander or lead federal agency regarding disposal actions.
 - **Specific decontamination methods** - A decontamination method, specific to the type of CBRN agent contamination, may contribute to the increased efficacy of the decontamination process. Users should seek specific guidance regarding decontamination and disposal procedures for specific types of contamination from the local incident commander, state public health department, lead federal agency, or respirator manufacturer. For more information on the exact decontamination process for Sarin (GB), visit the CDC link at: <http://www.bt.cdc.gov/agent/sarin/erc107-44-8pr.asp>. For more information on the exact decontamination process for Sulfur Mustard (HD), visit the CDC link at: <http://www.bt.cdc.gov/agent/sulfurmustard/erc505-60-2pr.asp>.

Guidance on decontamination methods for chemical protective clothing:

Related decontamination guidance for industrial chemical protective clothing is available through the American Industrial Hygiene Association (AIHA) Guideline 6-2005, *Guideline for the Decontamination of Chemical Protective Clothing and Equipment*, and the OSHA/NIOSH CBRN PPE matrix at <http://www.osha.gov/SLTC/emergencypreparedness/cbrnmatrix/index.html>.

Appendix A: Component Diagram – Non-Detachable Regulator

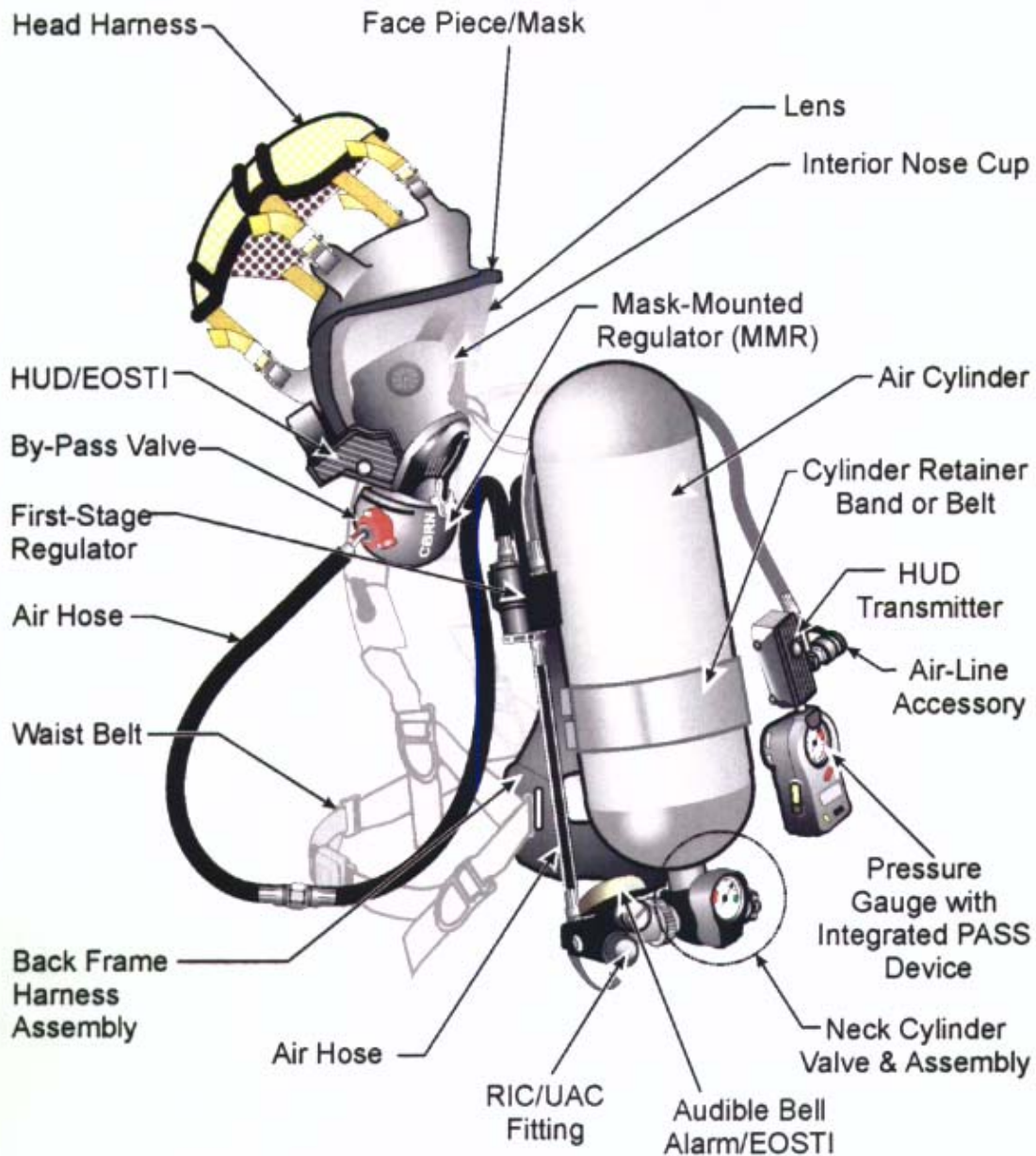
Generic CBRN SCBA with a Mask-Mounted Regulator (MMR), Non-Detachable



Frontal view of respirator: generic drawing adapted from International Safety Instruments, Inc. (ISI), August, 2006.

Appendix B: Comp Diagram – Detachable Regulator

NIOSH-Certified SCBA with CBRN Protections Mask-Mounted Regulator (MMR) Version Schematic View 2



Rear cylinder view of respirator with frontal view of facepiece: generic drawing adapted from Mine Safety Appliances Co. (MSA), August, 2006.

Appendix C: References

- CDC [2007]. CDC Specimen – Collection Protocol for a Chemical-Exposure Event.
<http://www.bt.cdc.gov/labissues/pdf/chemspecimencollection.pdf>
- NFPA [2007]. National Fire Protection Association 1981: Standard on Open-Circuit Self-Contained Breathing Apparatus for Emergency Services, 2007 Edition.
- NIOSH [2006]. Letter to All Respirator Manufacturers. NIOSH NPPTL and NFPA Joint Approval Process for NFPA 1981(2007 Edition) Respirator Approvals, December, 2006.
- NFPA [2007]. National Fire Protection Association 1994: Standard on Protective Ensemble for First Responders to CBRN Terrorism Incidents, 2007 Edition.
- OSHA/NIOSH [2006]. OSHA/NIOSH Interim Guidance, CBRN PPE Selection Matrix for Emergency Responders – Nerve and Blister Agents, February, 2006.
<http://www.osha.gov/SLTC/emergencypreparedness/cbrnmatrix/nerve.html>
- NFPA [2006]. NFPA 1404: Standard for Fire Service Respiratory Protection Training.
- AIHA [2005]. Guideline for the Decontamination of Chemical Protective Clothing and Equipment. American Industrial Hygiene Association (AIHA), AIHA Guideline 6-2005.
- NFPA [2005]. National Fire Protection Association 1991: Standard on Vapor-Protective Ensemble for Hazardous Materials Emergencies, 2005 Edition.
- NIOSH [2004]. NIOSH Emergency Response Card – Blister Agent – Mustard
<http://www.bt.cdc.gov/agent/sulfurmustard/erc505-60-2.asp>
- NIOSH [2004]. NIOSH Emergency Response Card – Nerve Agent Sarin
<http://www.bt.cdc.gov/agent/sarin/erc107-44-8.asp>
- NIOSH [2003]. NIOSH Letter to All Manufacturers. Upgrade of Previously-Deployed SCBA Configurations to CBRN Approval Status.
<http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/ltr-031103c.html>
- NIOSH [2002]. Interim Recommendations for Firefighters and Other First Responders for the Selection and Use of Protective Clothing and Respirators Against Biological Agents. Cincinnati, OH: U.S DHHS, Public Health Service, Centers for Disease Control, DHHS (NIOSH) Publication No. 2002-109. <http://www.cdc.gov/niosh/unp-intrecppe.htm>
- NIOSH [2001]. NIOSH letter to All Respirator Manufacturers. Acceptance of Applications for the Testing and Evaluation of Self-Contained Breathing Apparatus for Use Against Chemical, Biological, Radiological and Nuclear Agents.
<http://www.cdc.gov/niosh/npptl/resources/pressrel/letters/ltr-122801.html>

Notes:

[illegible]

NPPTL

Delivering on the Nation's Promise:

*Safety and health at work for all people
Through research and prevention*

For information about NIOSH:

1-800-35-NIOSH (1-800-356-4674)

Fax: 513-533-8573

E-mail: pubstaft@cdc.gov

www.cdc.gov/niosh



Photograph depicts a frontal concealed two-man law enforcement sniper team in Level B protection providing overwatch security to a SWAT entry team during a CBRN-barricaded suspect apprehension training exercise. The SCBA cylinders are in rip-stop cloth concealment shrouds on the left of the photograph. Notice that the SCBA is separate from the ballistic vest worn by the responder and the vests are underneath the SCBA but overtop the protective ensemble. This photograph was taken in May 2005 during NIOSH participation in a National Tactical Officers Association (NTOA) lead tactical SCBA training course conducted for the Fort Collins SWAT team, Fort Collins, Colorado.

